

## **CARSON RIVER DEER HERD STUDY PROPOSAL**

**Project Leader: Terri Weist**

### **INTRODUCTION**

The Carson River Deer Herd (CRDH) is an interstate deer herd that encompasses portions of El Dorado, Alpine and Mono Counties in California and Douglas County in Nevada (Fig. 1). While the population of this deer herd has been static, the trend has shown a decline in herd numbers (Fig. 4).

The reasons for this decline are assumed to be habitat changes due to rapid urban development in Nevada, predation, road kill and other common mortality factors. Habitat use and distribution by the CRDH has probably changed since the CRDH Management Plan was written in 1982. This study proposes to delineate current distribution, migration patterns and mortality factors affecting the CRDH today.

Obtaining current habitat use, migration patterns and distribution of the CRDH will aid in developing management strategies and improve the decision-making processes for habitat improvements or other mitigation measures.

The California Department of Fish and Game (Department) and the Nevada Department of Wildlife (NDOW) meet annually to discuss and distribute deer tag quotas for several interstate deer herds. Distribution of the allowable deer tags is based upon percentages. Before 2006, 70% of the deer tags for the X8 deer zone (the Carson River Deer Herd) were allocated to California and 30% were allocated to Nevada. NDOW has stipulated that their late season hunts actually killed "Nevada" deer and that deer from California do not arrive until after their hunts are over. Currently, the distribution of allocated tags is 50% to California and 50% to Nevada. This study proposes to allocate the deer tags based upon quantifiable data and current deer range information.

### **STUDY AREA**

The Carson River Deer Herd encompasses approximately 851 square miles of both summer and winter range habitats (Fig 2). In the 1982 management plan, winter range was estimated to be about 210 square miles (25% of the total herd range) and 641 square miles was designated as summer and intermediate ranges (75%) (Carson river deer herd management plan, Dept. of Fish and Game, 1982).

This deer herd includes the Lake Tahoe Basin, portion of the Carson-Iceberg Wilderness, three state-owned wildlife areas, Desolation Wilderness and Native American lands within the state of Nevada. Much of the area within the California side of the CRDH's range is public land owned and managed by either U.S. Forest Service or Bureau of Land Management.

Habitats within the CRDH include wet meadows, aspen, pinyon-juniper woodland, bitterbrush-sagebrush communities, Sierra mixed conifer and montane chaparral. Elevations range from 4,800 to 6,000 feet in the winter ranges and 6,000 to 11,000 feet in the summer range.

### **Study Objectives and Methods**

#### Option A.

The objective of this effort is to obtain current distribution and migration patterns of the Carson River Deer Herd (CRDH) to aid in deer tag allocations between California and Nevada. For the first year, ten adult female mule deer (*Odocoileus hemionus hemionus*) will be captured within the eastern portion of the CRDH range and fitted with Iridium satellite collars. Deer will be captured on their summer range in order to determine where and when they travel to their winter range (fig 3). Radio collars will be tested for accuracy prior to deployment.

Deer will be captured using a combination of methods. Free range darting will be the primary method of deer capture. However, other methods including clover trapping, net gunning from a helicopter and drive netting may be used if necessary. NDOW is currently utilizing a helicopter company to net gun deer in western Nevada. CDFG could utilize the same company should all collars not be deployed by the winter for less cost due to their proximity of current efforts.

Two animal locations will be recorded per day and downloaded at least every other day via the webserver. Within 1.5 and 2 years, the battery life of the GPS collars will require refurbishment. Collars will be pre-programmed to remotely detach whereby they will be collected, battery packs replaced and new drop off mechanisms installed. These collars will then be ready to re-deploy on ten additional deer during the second year of the study. In addition, we will purchase an additional ten satellite collars to deploy in year two. By the end of the three year study, 30 animals will be studied.

A geographic information systems (GIS) based modeling approach will be employed to evaluate home range and important habitat features such as fawning areas, migration corridors and critical winter range. The webserver depicts location data onto Google Earth (Google, Inc ver. 5.0), thereby depicting spatially explicit telemetry data.

## **Analysis**

### Mortality Estimation

A graduate student will be employed to monitor the deer and analyze distribution patterns more intensely than can be accomplished by existing Department personnel. The cause of mortality will be determined whenever possible. Deer mortality sensors activate via email which will facilitate a quick investigation response by Department personnel or the graduate student.

Locating deer at least three to four times per week will increase likelihood of finding the carcass and determining the cause of mortality (Samuel, M. D and M.R. Fuller, 1994). Cause of mortality will be classified as predation (with the species of predator identified whenever feasible), natural, human-caused (legal hunting, vehicle collision, etc) and "other" for calculations of mortality rates (Ballard et al., 2000). If possible, a necropsy and tissue samples will be collected to determine disease factors.

### Home Range Analysis

Specific statistical analysis will not be identified until we know the sample size (i.e., the number of deer that will be fitted with transmitters). However, heuristic smoothing procedures or non-parametric maximum likelihood techniques will be utilized to estimate home range (Garton, E.O. 2007).

### Survival

Radio telemetry data can be used to estimate survival rates if the number of animals that are followed is adequate (Krebs, C.J. 1989). Cause-specific mortality estimates can be estimated using nonparametric staggered-entry Kaplan-Meier survival estimator (Heisey, D.M. and B.R. Patterson, 2007; McCorquodale 1999).

Survival estimates for the study animals requires a more complex analysis (Samuel and Fuller, 1994). A modification of the Kaplan-Meier estimator was developed by Pollock et al (1989) to allow new animals to be added to the study (staggered entry).

### Habitat Selection

As the number of animals or the number of observations per animal increases, the test is more powerful in detecting differences in habitat use. Alldredge and Ratti (1986) recommend against having few observations on few animals (less than 20).

## **Capture Methods**

**Free Range Darting:** Chemical immobilization through free-range darting with Pneu Dart compression rifles will be one capture method for this project. Adult deer will be immobilized via a dart filled with a mixture of Telazol<sup>®</sup> and Xylazine. After chemical immobilization, the doe will be restrained, hobbled and blindfolded. Vital signs will be monitored every 10 minutes throughout processing. Water and blankets will be available for use during capture to maintain body temperature within the desired range. Blood will be drawn from each animal. Antibiotics and vitamin/mineral (Vitamin E, selenium) supplements will be administered via intramuscular injection. After processing the radio collar and ear tags will be applied. The doe will be administered a reversal drug (Tolazoline) 60 minutes post chemical immobilization drug administration. All deer will be monitored until full recovery occurs.

Drug dose will vary depending on the size of the deer but previously we have used a 1:1 ratio of Xylazine to Telazol with a dose of 150 mg/kg. The range of dosage will fall within the following; 2.2-3.3 mg/kg Telazol<sup>®</sup> and 2.0-3.3 mg/kg Xylazine. Mule deer from this area typically have an average body weight of 130 pounds. 1.3-1.5 cc of mix will be used per 130 pound deer. Initial doses will be used for a range of 90-110 pounds. Weight of every deer will be estimated using chest girth. If weights are larger than anticipated, then dose will be increased.

**Drive Netting:** One way to employ this method involves the use of a helicopter to herd deer into a drive net that has been set up on the ground. Many deer can be processed this way. Crews on the ground equipped with radios to communicate when deer are in the net. Crews will process the deer as described above without the use of chemical immobilization.

Another method is to set up a drive net across a known migration or deer trail, near a water hole or other high deer use area, wait for deer to approach the net and either scare it in or let it voluntarily enter the net. Baiting an area with food and/or salt blocks would increase the likelihood that deer would utilize the area. The disadvantage of this method is the long wait period and no guarantee of success.

**Net Gunning:** The advantages to net gunning include dispersing radio collars over a wider geographical area, targeting specific animals and it does not require chemical immobilization. However, both net gunning and drive netting using a helicopter is expensive and involves an increased safety hazard. Mobile processing crews may be utilized should this method be used.

If drive netting or net gunning is used, the guidelines established in the State of California, Dept. of Fish and Game, Wildlife Restraint Handbook (2005) will be employed to ensure the safety and well-being of the crew and the animals.

### **Data and Biological Sample Collection**

Data collected from each deer will be recorded on individual data sheets and will include at least the following:

1. Location of capture – descriptive and GPS coordinates
2. Sex
3. Age – based on visual assessment of body conformation and tooth wear patterns.
4. General body condition – body fat, parasite load, abnormalities.
5. Neck circumferences (base, mid, and top).
6. Weight – estimated with torso tape.
7. Blood – Approximately 35-60 cc of blood will be collected from each animal and placed into red-top and lavender top tubes. Blood collected in red-top tubes will be centrifuged and serum will be frozen for submittal to the DFG Wildlife Investigations Lab (WIL). Purple top tubes will be frozen for submittal to WIL.
8. Ear tag types and numbers
9. Radiocollar information (type, serial number, frequency)

The project leader will provide the WIL with complete records of the use of chemical immobilization drugs. An *Immobilization Data Sheet* (Appendix E) will be filled out **at the time of the immobilization attempt**, including the following information: date, location, animal identification number, species, sex, actual or estimated age and weight, health status/condition, drug(s) used, dosage(s), route of administration, and response to drug. The completed data sheet will be submitted to WIL the following business day (fax 916-358-2814; or by e-mail: [pswift@dfg.ca.gov](mailto:pswift@dfg.ca.gov)). In addition, the project leader will compile and submit a quarterly drug inventory to WIL. All losses (missed darts) will be accounted for and attempts will be made to collect the missed darts.

Funding Sources  
Big Game Funds

Media Coverage  
None

### **Key Personnel Needs**

A minimum number of people for the free-range darting capture method would be two to six individuals.

## **Personnel and Animal Safety**

A planning and safety meeting will be held prior to the capture effort. Initial assignments, animal handling protocols, and other pertinent aspects of the operation will be discussed. All participants will have prior experience in capturing and collaring deer. Emergency contact information will be on-site and readily available during operations (found in Appendix B).

The objective will be to safely capture mule deer while minimizing potential hazards to animals and capture personnel. Safety and medical considerations listed on pages 3-1 through 3-3 and 9-1 through 9-13 of the DFG Wildlife Investigations Laboratory's Wildlife Restraint Handbook will be followed (included in Appendix C).

## Literature Cited

Ballard, W.B. H.A. Whitlaw, B.F. Wakeling, R. L. Brown, J. C. DeVos Jr. and M.C. Wallace. 2000. Survival of female elk in northern Arizona. *Journal of Wildlife Management* 64(2):500-504.

Carson River Deer Herd Management Plan. 1982. Fower, Gene S. and Daniel Hinz. Calif. Dept. of Fish and Game & U.S. Bureau of Land Mgt. 108 pp.

Garton, E.O. 2007. New Approaches to studies of home range, habitat selection and space use. A workshop for Calif. Dept. of Fish and Game biologists. Bishop, CA.

Heisey, D.M. and B.R. Patterson, 2007. A review of methods to estimate cause-specific mortality in presence of competing risks. *The Journal of Wildlife Management* 70 (6). Pgs. 1544-1555.

Krebs, Charles J. 1989. *Ecological Methodology*. Harper & Row, Publishers. New York. 654 pp.

Pollock, K.H. S.R. Winterstein, S.M. Bunck and P.D. Curtis. 1989. Survival analysis in telemetry studies: the staggered entry design. *Journal of Wildlife Management*. 53:7-13.

Samuel, M. D., and M.R. Fuller. 1994. *Wildlife Radiotelemetry*. pages 370-418 *in* Research and management techniques for wildlife and habitats. Fifth edition. The Wildlife Society, Bethesda, Maryland, USA.

Wildlife Restraint Handbook. 2005. The State of California, Resources Agency, Dept. of Fish and Game. Chapt. 5. pgs 5-4-5-12.

**Itemized Cost Analysis**

<b>FY 11/12</b>			
<b>ITEM DESCRIPTION</b>	<b>QUANTITY</b>	<b>Unit price</b>	<b>TOTAL</b>
Iridium satellite collars	10	\$2,250.00	\$22,500.00
Peripherals (receiver, cables, batteries, etc)			\$11,120.00
Airtime fee (\$30/mo/collar) for one year	10	\$300.00	\$3,600.00
1 year worth of airtime	10		\$220.00
Webserver fee	10	\$100.00	\$1,000.00
<b>Transmitter total</b>			<b>\$38,440.00</b>
<b>Extraneous supplies</b>			
backpacks for capture equipment (including tax/shipping)	2	\$123.00	\$246.00
Midland GXT 760 VP 4 pack	1	\$65.00	\$65.00
stretchers	2	\$140.00	\$280.00
Flambeau T5 Pro tackle box	2	\$70.00	\$140.00
Immobilization drugs (for 2012)	10		\$1,300.00
Misc drugs such as eye ointment, prophylactics	10		\$500.00
Misc capture equipment (one time purchase)			
ex: darting supplies;			\$1,800.00
new dart gun (Model 389) opt. (incl. FET)	1	\$780.00	\$780.00
pliers, ear tags, wrenches, wt measuring tapes	2		
<b>Extraneous supplies total</b>			<b>\$5,111.00</b>
UNR Grad Student or scientific aid	1		\$25,000.00
possible net gun capture (private contractor)	5		\$3,000.00
<b>GRAND TOTAL</b>			<b>\$71,551</b>

<b>FY 2012/13</b>			
<b>ITEM DESCRIPTION</b>	<b>QUANTITY</b>	<b>Unit price</b>	<b>TOTAL</b>
collar replacement and additional collars	10	2,700	\$27,000.00
1 year worth of airtime (year 2 with 20 collars)	20		\$440.00
Webserver fee (for N=20)	20	\$100.00	\$2,000.00
battery/drop off mechanisms (additional 10 collars)	10	700	\$7,000.00
Immobilization drugs (for 2012)	20		\$1,500.00
Misc drugs such as eye ointment, prophylactics	20		\$1,000.00
darts			\$1,200.00
possible net gun operation	5		\$3,000.00
UNR grad student or scientific aid	1		\$25,000.00
<b>TOTAL FY 12/13</b>			<b>\$68,140.00</b>

FY 13/14			
ITEM DESCRIPTION	QUANTITY	Unit price	TOTAL
misc			\$1,000
1 year worth of airtime	20		\$440.00
Webserver fee	20	\$100.00	\$2,000.00
UNR grad student	1		\$30,000.00
Total			\$33,440

3 year total	<b>\$71,551</b>
	<b>\$73,640</b>
	\$33,440
GRAND TOTAL	<b>\$178,631</b>



## **APPENDIX A**

### **FIGURES**



Fig. 1. Map of deer herd boundaries in California

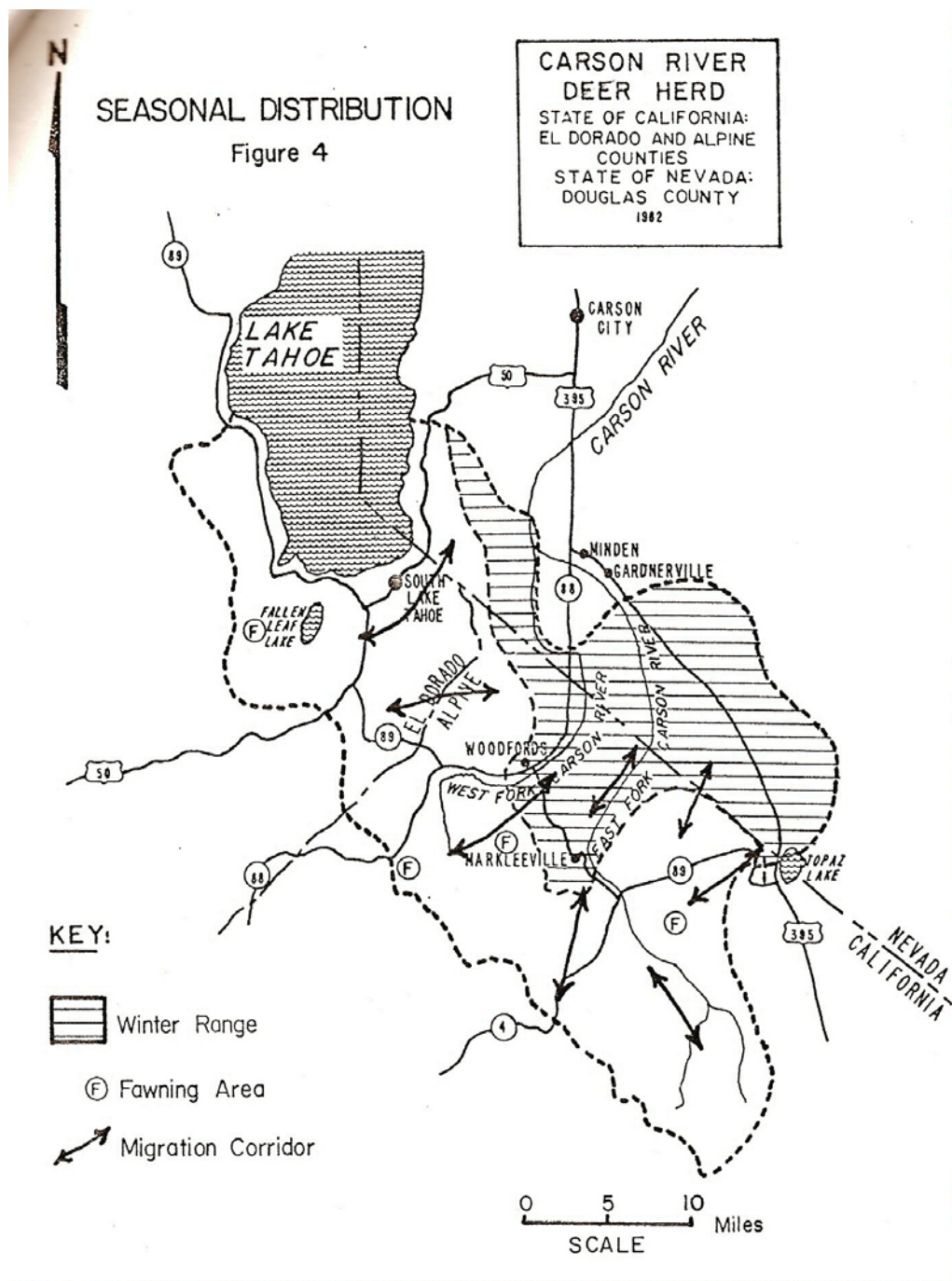


Fig. 2. Current range map depicting migration routes

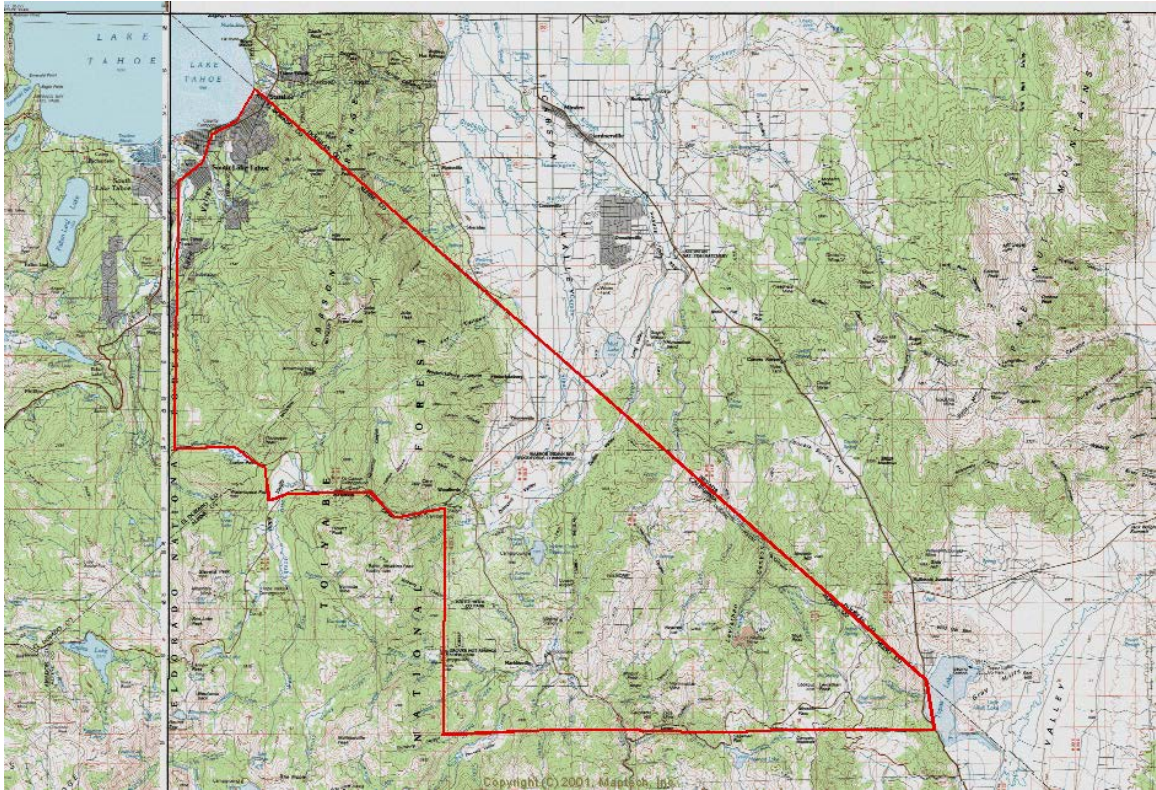


Fig. 3. Carson River Deer Herd study area map

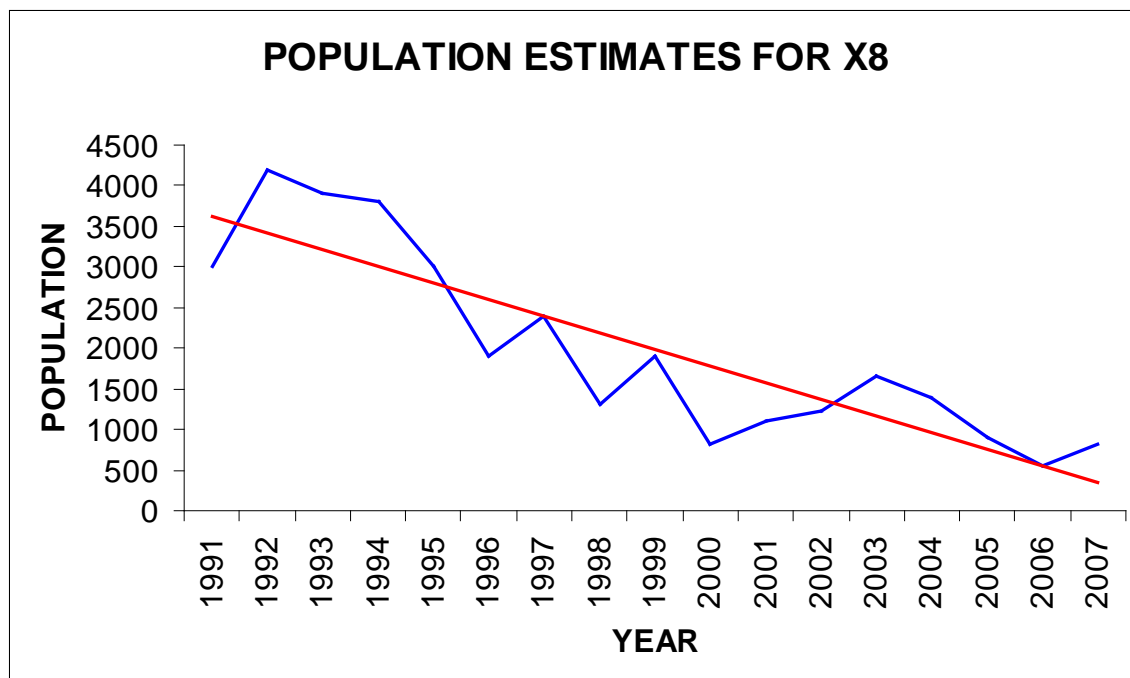
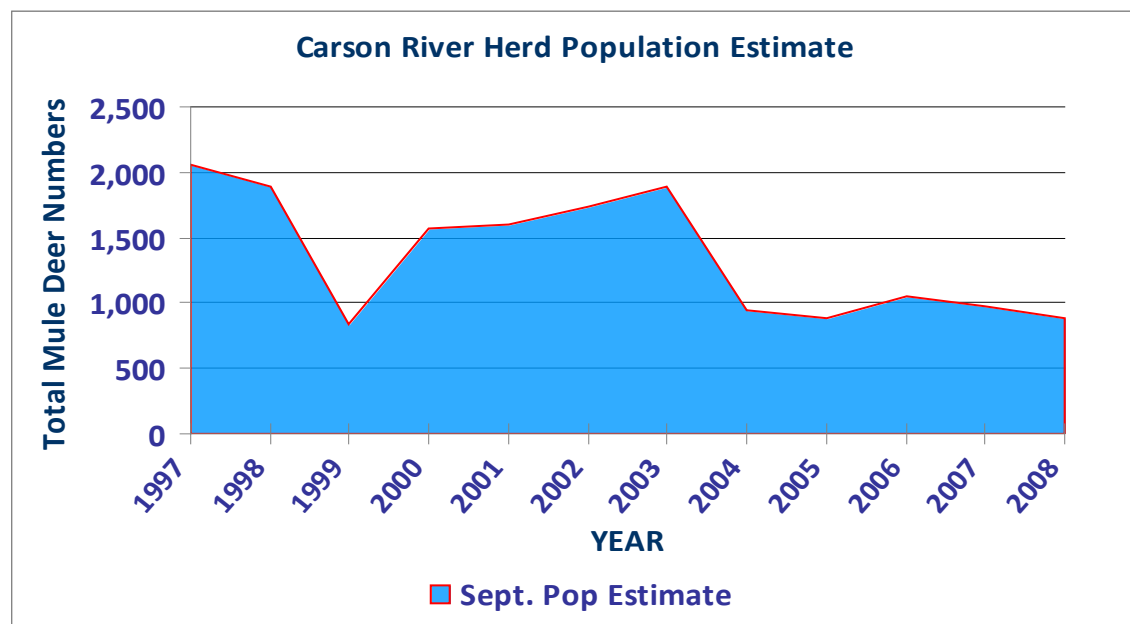


Fig. 4. Population graph depicting decline in the Carson River Deer Herd.



Source: NDOW 2009 Interstate Deer Meeting, Reno, NV.